ENVIRONMENTAL CONSEQUENCES

This section describes the probable consequences (impacts, effects) of each alternative on selected environmental resources. This section is organized by alternatives. Impacts are expressed in terms of the beneficial or negative effect on the human environment. The human environment includes biological (natural resources), historical (cultural resources), social, and economic factors. Natural resources include the land, air, water, fish and wildlife, plants, fossils, and scenic, geologic, or other natural feature(s). National Natural Landmarks are also included in this definition. Cultural resources include historic structures, landmarks, landscapes, archeological sites, National Register or National Register eligible properties, and National Historic Landmarks.

This analysis provides the basis for comparing the effects of the alternatives. In considering the impacts, the intensity, duration, and cumulative effects are assessed. Since the alternatives described in the SRS are presented in a general "brushstroke" manner, the analysis of environmental consequences also must be general. Thus, the ideas presented in this EA are conceptual. The NPS can only make reasonable projections of likely impacts.

Methodology: The NPS based this impact analysis and conclusions on the review of existing literature; information provided by experts within the NPS and other agencies; and the professional judgment of the Loess Hills Special Resource Study Team members. The National Environmental Policy Act requires that an agency evaluate environmental impacts associated with an action. For purposes of this Environmental Assessment, the action is the selection of a management alternative. For example, the formation of a Joint Powers Board in Alternative 2, or the establishment of a National Reserve in Alternative 3 would be the action. Carrying out the activities associated with each management alternative and implementing applicable Comprehensive Plan is evaluated as long-term impacts.

Assumptions: Because of the conceptual nature of the alternatives, the projections of likely impacts are based upon a number of assumptions. These assumptions are as follows:

- The management entity (individual counties, JPB, State, other) would be committed to preserving and protecting the significant resources of the Loess Hills. Comprehensive Plans would be developed and implemented.
- The management entity would represent a variety of interests and involve appropriate technical experts (geologists, ecologists, archeologists, interested tribes, etc.) as advisors in the planning process.
- Appropriate and meaningful resource inventory and monitoring data would be collected during the implementation planning and decision making process and Ethnographic resource studies would be completed.
- Specific landform boundaries would be established if Alternative 2-5 were selected.

- The Jones Creek and Glenwood sites would be evaluated for and receive National Historic Landmark status.
- For Alternatives 1 and 4, it is assumed that all of the individual counties would eventually develop an integrated land use management plan and would coordinate their management activities where feasible and practicable.
- In Alternative 2, it is assumed that all seven counties would adopt/implement the Comprehensive Management Plan developed by the JPB.
- The Loess Hills Alliance, The Nature Conservancy, Iowa Heritage Foundation, Rural Conservation Districts, and other entities identified in the SRS would continue their land conservation and education activities.
- Existing conservation programs would continue to be made available to private landowners for conservation practices.
- All management entity(s) would be fully operational, funded, and establish a process for accountability, if necessary.
- Because a significant portion of the Loess Hills are in private ownership (approximately 95 percent), it is assumed that eventually a majority of landowners would take advantage of federal, state, and local programs to protect natural/cultural resources of the Loess Hills.
- Excavation and quarry activities would be regulated to protect sensitive resources.
- For purposes of this analysis, since it is not possible to predict when/where land donations and/or purchases occur, it is assumed that the State of Iowa's current land protection plans and policies would not change.

Context: Impacts, either beneficial or negative, are discussed in terms of the effect on the resource or impact topic throughout the entire landform region (640,000-acres), unless otherwise noted.

Timing: It is impossible to predict when any of the alternatives would be adopted. As such, it is impossible to predict the timing of any impacts resulting from any of the five alternatives. Hence, the specific timing of impacts is not addressed in this EA. The timing of impacts would need to be addressed during future planning processes.

Intensity: For the purposes of this analysis, intensity or severity of the impact is defined as:

- *Negligible*-impact to the resource or socioeconomic element is barely perceptible and not measurable or is confined to a small area
- *Minor*-impact to the resource or socioeconomic is perceptible and measurable and is localized.
- *Moderate*-impact is clearly detectable and could have appreciable effect on the resource or socioeconomic environment.
- *Major*-impact would have a substantial, highly noticeable influence on the resource or socioeconomic environment.

Duration: The duration of the impacts in this analysis is defined as:

- *Short-term*-impacts are those that occur within the first three years of initiation.
- *Long-term*-impacts would extend beyond initiation of the alternative and would likely have permanent effects on the resource or socioeconomic environment.

Direct and Indirect Effects

- *Direct effects* are caused by the action and occur at the same time and place
- *Indirect effects* are caused by the action, but occur later in time or are further removed in distance, but must be reasonably foreseeable. Indirect effects may include changes in ecological processes that result in a change to the environment.

Derivation of Impact Topics

Specific impact topics were developed to focus discussion and to allow comparison of the environmental impacts of each concept. These impact topics were identified based on federal laws, regulations, and NPS *Management Policies* (2001); NPS knowledge of affected resources; and concerns expressed by the public or other agencies during scoping. A brief rationale for the selection of each impact topic is given below, as well as the rationale for deferring specific topics for future consideration and analysis.

Geologic Resources. Geologic resources include the shape of the landforms in the Loess Hills and the underlying materials, including the loess deposits. The Loess Hills, as a geologic feature were found to be nationally significant in the Special Resource Study. Because the loss of loess from erosion, mining activities, and the subsequent loss of entire bluffs were one of the primary concerns noted during public meetings, impacts to geologic resources will be analyzed in this EA.

Natural Resources: Approximately 700 species of vascular plants have are found in the Loess Hills, and numerous mammals, birds, insects, reptiles and amphibians. Most scientific interest has focused on the prairies that support a variety of rare western plants and animals. Because of the nature of the concepts, it is impossible to identify animal and plant communities that could be affected, particularly in the short term. However, some discussion is possible on the general amount of potential disturbance to these communities, particularly the prairie components. Fire suppression and/or prescribed fires have direct impacts on the composition and distribution of prairie species. The protection of prairies and the lack of fire were identified as an issue during the scoping process. Long-term impacts to vegetation are therefore discussed in this EA.

Scenic Resources: The steep bluffline that rises sharply from the Missouri River floodplain is a recognizable signature of the landform. The hills, narrow ridgecrests, "catsteps," pastures, ponds, narrow gravel roads, historic churches, and small towns, contribute to the scenic quality of the landscape. Impacts to these resources are discussed in this EA.

Socioeconomic Environment: NEPA requires an analysis of relevant impacts to the human environment. The human environment is interpreted to include the natural and physical environment and the relationship of people with that environment (40 Code of Federal Regulations 1508.14). In the short-term, local communities would be involved in the planning process in various degrees. Additionally, local communities that provide public services and receive tax revenue or benefits to their economies through retail trade could be affected by alternatives proposed. Local vs. Federal ownership of property and control of land-use decisions within the Loess Hills was a significant issue raised during the scoping process. Both short-and long-term socioeconomic impacts are therefore analyzed in this EA.

Impact Topics Considered but not further addressed in this Environmental Assessment

Threatened and Endangered Species: The Endangered Species Act 1973, as amended requires federal agencies to protect federally listed species and their habitats and requires federal agencies to consult with the U.S. Fish and Wildlife Service if their activities may affect listed species. There are seven federally listed species that are known to have been present within one or more of the seven counties that the Loess Hills are located. The U.S. Fish and Wildlife Service was contacted on May 8, 2001 and indicated that no formal consultation was necessary as this project was only a study (Mr. G. Bady, personal communication). National Park Service policies require the Service to consider impacts to state listed species. However, it is difficult to identify potential impacts to state listed species because no concept specifies a development location or a specific action, which would affect sensitive species and their habitats either negatively or positively. If and when specific development activities are proposed, an analysis of potential impacts, if any, to state and/or federally listed species would be necessary to fulfill compliance requirements.

Water Resources: The Federal Water Pollution Control Act (commonly referred to as the Clean Water Act), as amended in 1987, was enacted to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The backbone of the Clean Water Act is its goal of eliminating the discharge of pollutants, from point and non-point sources, into the nation's waters. Individual states are responsible for the establishment of clean water standards for various bodies of water. The administration and enforcement of most of the provisions in the act are also accomplished by the states.

It is difficult to identify potential short term impacts to water resources because no concept specifies a development location or a specific action which may affect water resources either negatively or positively. If and when specific development activities are proposed, an analysis of potential impacts, if any, on water quality would be necessary to fulfill compliance requirements. Long-term impacts to water resources resulting from erosion are discussed under geologic impacts, and are presented as an indirect effect.

Wildlife Resources: Some of the public comments indicated a concern that the natural habitats in the Loess Hills are becoming fragmented and could affect wildlife movements and

genetic diversity. The planning alternatives in the Study are generalized and do not include specific development plans or other specific changes to wildlife or the habitats that they depend upon. If and when development sites were selected that could alter wildlife habitat, impacts would be properly evaluated at that time.

Wetlands and Floodplains: Executive Order 11990 ("Protection of Wetlands") requires that all federal agencies must avoid, where possible, impacts on wetlands and Executive Order 11988 ("Floodplains Management)") requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. It is impossible to identify potential impacts to wetlands or floodplains because no concept specifies a development location. If and when development sites were selected, a wetland determination would be done and an analysis of potential impacts, if any, to wetlands and floodplains would be completed to fulfill additional compliance needs.

Air Quality: The Clean Air Act of 1990, as amended, established a regulatory program with the goal of achieving and maintaining "national ambient air quality standards" through state or, if necessary, federal implementation plans. If and when development sites were selected, an analysis of potential impacts, if any, on air quality would be completed to fulfill additional planning and compliance needs.

Cultural Resources: The National Historic Preservation Act, as amended in 1992, calls for the consideration and protection of historic resources in planning and development proposals. This includes tangible resources such as structures as well as less tangible resources, such as cultural landscapes and ethnographic values. This act includes properties listed on or determined eligible for the National Register of Historic Places and those designated as National Historic Landmarks. There are four National Historic Landmark properties in the Loess Hills, publicly owned and all within the jurisdiction of local cities that they are located in. There are over 50 properties located in the Loess Hills that are listed in or eligible for the National Register of Historic Places. Because none of the management concepts prescribe specific actions for the management or development of land or cultural resources within the Loess Hills, historic resources will not be directly affected by adoption of any of the action alternatives identified in this Special Resource Study, and thus will not be further analyzed.

Very few systematic archeological investigations have been conducted within the Loess Hills for the purpose of identifying archeological sites, and most of those that have been conducted were small-scale in nature. Most of the 827 archeological sites currently recorded in the Loess Hills were discovered as the result of erosion or development activities, such as quarrying, channelization, and construction of roads, buildings, and water impoundments. Such activities resulted in indirect damage to, and in many cases, destruction of, archeological resources. None of the management concepts prescribe specific actions for the management or development of land or natural and cultural resources within the Loess Hills that would directly impact archeological resources. However, erosion and development activities such as cited above could result in cumulative direct and indirect impacts to archeological resources where unified, comprehensive land-use planning is absent. Increased systematic efforts to identify, evaluate, and protect significant archeological resources could result from the development of comprehensive land use plans prescribed in Alternatives 2-5.

However, it should be noted that a lack of a regional comprehensive management plan with consistent regulatory authority across the landform would continue the patterns of identified threats that could adversely impact known or potentially eligible National Register of Historic Places and National Historic Landmark properties. These impacts may include: the actual destruction of historic structures, archeological sites, and cultural landscapes during development; alteration of historic road patterns; visual intrusions into the setting of historic properties (e.g., the construction of cell phone towers or houses adjacent to a historic property); or the in-growth of woody vegetation into formerly open, historically significant agricultural fields. Direct and indirect impacts to these resources should be properly evaluated during the development of a Comprehensive Plan associated with the action alternatives.

The study recommends the completion of cultural affiliation and traditional cultural property studies to identify Native American groups that are historically or culturally affiliated with the Loess Hills, and the places within the Loess Hills that are important to those peoples. The information from these studies should, in turn, feed back into management decisions that take Native American concerns into account. At this time, however, it is difficult to predict impacts to ethnographic resources because of the generalized nature of the concepts. Prior to the implementation of one or more concepts complete consideration of impacts to ethnographic resources would be necessary to fulfill additional compliance needs.

Noise: Noise problems are those associated with day to day activities, such as traffic, construction, and manufacturing/mining activities. Noise levels are much higher in the vicinity of Sioux City and Council Bluffs (Iowa) than activities in outlying areas. Neither of the alternatives would result in positive or negative impacts to the soundscape or noise levels in the study area. Therefore, noise impacts were not analyzed in the EA.

ANALYSIS OF IMPACTS ASSOCIATED WITH EACH ALTERNATIVE

Impacts associated with Alternative 1 (No Federal Involvement)

This alternative relies heavily on the initiative of individual LGUs in the region and continued coordination by the Loess Hills Alliance to protect the significant resources of the Loess Hills. Under this approach, primary responsibility is placed in the hand of local governments to implement conservation objectives. This option recognizes the positive steps that have already been taken by the Loess Hills Alliance, state and local governments, and other conservation groups. It does not, however, ensure that a holistic, coordinated approach to land-use planning for the entire landform would occur in the near future. Rural housing development, urban and industrial expansion, highway construction, mining operations, and overgrazing are ongoing activities that could substantially impact the resources of the Loess Hills.

Assuming that individual government units would eventually develop comprehensive plans, the differences among these plans (for example in ordinances, resource focus, or funding capabilities) would present numerous challenges. Because natural resources do not have jurisdictional boundaries (loess deposits, and the plants and animal communities cross county lines), a local commitment to preserving the integrity of the Loess Hills in a holistic manner would be essential and would require coordination throughout the seven-county region. Otherwise, local efforts may be duplicated (e.g. conducting prescribed burn training in each locality, vs. conducting one or two within the region) or, conversely, there may be gaps in addressing critical resource issues (e.g. regulation of mining throughout the area).

Impacts to Geologic Resources: Highly erodible loess soils are characteristic of the entire landform region. The development of zoning ordinances, regulation of mining activities (sand/gravel/quarrying) and planning for suburban developments could help alleviate the threats identified in the Special Resource Study. However, the implementation of individual County Comprehensive Plans would likely be staggered or spread out over time. Thus, in parts of the landform, loess deposits, bluffs and other topographic features could continue to be irreversibly altered and degraded either by unregulated quarrying and borrow-pit operations, suburban developments, or removal of vegetation. This would alter normal drainage patterns, and lead to instability of slopes. As a result of unstable slopes, entire bluff faces could continue to fail and natural gully formation would be accelerated. In Counties that readily implement land management plans to address these types of problems, the impacts would be either minimized or avoided.

Similarly, in parts of the landform, severe erosion problems and increased stream sediment loads could occur as a result of slope failures. Management decisions that involve tillage or disturbing native vegetation without consideration of stabilization needs could exacerbate erosion. These impacts would extend well beyond the region because sediment loads would continue to be transported downstream to other areas.

Conclusion: Existing threats and direct impacts could continue upon selection of this alternative in areas that do not readily adopt management strategies to address these problems. Negative impacts would be prevented in other areas. This could fragment the landscape. Over time, the indirect impacts could be moderate to major, long-term and negative.

Impacts to Vegetation: Upon selection of this alternative, the immediate impacts to vegetative resources would be negligible. However, as in the above, the implementation of individual Comprehensive Plans would be staggered or spread out over time. Existing efforts by The Nature Conservancy and Rural Conservation Districts would continue, but may not necessarily be coordinated across the landform in an ecosystem approach. Financial resources and staff time may or may not be directed towards areas in critical need. Assuming that the present trends in population growth, residential development, and encroachment of woody plants persist, then the loss of native prairies would likewise continue in some portions of the landform. This would fragment remaining native prairie communities in some areas, and in other areas prairies would be lost. As individual Comprehensive Plans were

developed, assuming they addressed preservation and management of prairie and other vegetation communities, some of these impacts would be avoided or minimized, although many impacts would be irreversible.

Conclusion: Existing threats and direct impacts could continue upon selection of this alternative in some areas, and be prevented in other areas, thus fragmenting the landscape. Over time, the direct and indirect impacts would be moderate to major, long-term, and negative.

Impacts to Scenic Resources: Upon selection of this alternative, the direct impacts to scenic resources would be negligible. As growth continued, improved protection of the Hills could encourage more people to visit, thereby increasing the need for additional, fuel stations, shopping centers, restaurants, roads and road improvements (e.g. straightening/widening of country roads). This could alter the character of the landscape and impact scenic vistas. Desired landscape characteristics of some sites may deteriorate if any of the component parts are unknowingly modified in an undesirable way. As each county developed and implemented zoning ordinances or other tools with resource conservation in mind, these changes to the landscape could be reduced.

Conclusion: The existing problems and threats could continue in certain areas until all counties addressed these issues in some manner. The immediate impacts would be negligible. Over time, impacts could affect the entire landform region. The impacts from this alternative could be minor to moderate, and have long-term, negative effects.

***Socioeconomic Impacts*:** The area of the impact would be primarily the communities within or adjacent to the landform region. Economic impacts to other areas would diminish with distance from the landform region. The 1996 study by Alexander and Otto found that tourists spend about $11.8 million annually in the Loess Hills. This level of expenditure could reasonably be expected to continue under this alternative. Assuming individual counties prepared land use plans with resource conservation in mind, improved protection of the Hills could encourage more people to visit, thereby increasing tourism expenditures. Conversely, if important resources were lost, then tourism dollars could be expected to decline.

Changes in local ordinances could affect the types of land use allowed in the Hills. This could impact tax base and other revenue streams in either a positive or negative direction, depending on the controls. If implemented, property tax credits could affect the local tax base. The extent of the impact would be dependent on the structure and amount of the credits. Stricter controls on uses such as residential development and extraction activities could have negative impact on businesses that are engaged in these activities. Limitations on land uses within the landform also could suppress future growth in the tax base that might otherwise be realized as land was converted from agriculture to more intensive uses. Conversely, increased visitor service facilities could lead to increased tourism and associated benefits.

In the absence of local ordinances that address quarrying, erosion, and slope failure, gullies would continue to widen, bridges and roads could give way. This could occasionally restrict access to farm fields and could increase expenditures for highway maintenance. The

prevention of undesirable impacts to natural, cultural and scenic resources would cost less than future expenditures to mitigate or reverse these impacts.

Conclusion: Overall, there would be long-term, negligible positive impacts (barely perceptible and not measurable).

This alternative does not include federal involvement beyond what is presently occurring, nor does this alternative include federal acquisition of land. There would not be an additional cost to the federal government.

Impacts Associated with Alternative 2

This alternative emphasizes the development of a single Comprehensive Plan for the entire Loess Hills landform region and could involve NPS assistance and review of land-use plans. The Comprehensive Plan (CP) would identify areas within the Loess Hills that are compatible with residential and industrial growth, agricultural uses, and recreation. Sensitive resource areas in need of specific protection strategies would be identified and protected. The CP would provide model ordinances for the landform, which could be adopted on a voluntary basis by member counties, as appropriate. This approach would enable local governments to take a comprehensive look at the entire landscape and make decisions about environmental, development, quality of life, and economic concerns through a single, unified process. While the primary responsibility to implement conservation goals is placed in the hand of local governments, federal and state governments may play a role in setting standards and providing technical and financial assistance.

Impacts to Geologic Resources: The Joint Powers Board (JPB) would serve to provide a comprehensive, integrated strategy to protect the area's geology and lessen the negative impacts to geologic resources that are currently occurring. Assuming all of the local communities within the Loess Hills adopt the Comprehensive Plan developed by the JPB, and technical advisors from various state, federal, and local groups participate in the planning process, sensitive areas would be prioritized. Protective management strategies would be applied across the landform in a holistic manner.

Conclusion: Upon selection of this alternative, the immediate impacts would be negligible. Over time, this alternative would result in moderate, long-term, positive impacts. However, if the counties failed to participate or adopt the CP, then negative impacts could result. These impacts, as in Alternative 1, could be long term, and could have a substantial, highly noticeable influence on the resource (major, negative impact).

Impacts to Vegetation: The short-term impacts to vegetation would be negligible. In the long-term, assuming the various counties adopted a Comprehensive Plan as developed by the JPB and its advisors, an ecosystem approach to managing plant communities could provide major, long-term beneficial effects. Prairie communities and woodland habitats, particularly those that support state-listed species, could receive focused attention through landowner education and assistance programs, beyond what is presently occurring. Priority areas would

be identified based on resource condition (integrity) and threat. Native prairie preservation would be enhanced by restoration of natural processes such as fire, which combats tree invasion. Encroaching exotic plant species would also be addressed in a coordinated manner. Such efforts would continue on state lands as funding allowed.

Conclusion: Major, long-term, positive impacts would result once a CP was adopted. However, in the absence of an ecosystem management approach, including regulation of land use, negative impacts would be moderate (detectable and could have appreciable effect on the resource) to major (moderate to major, long-term, negative).

Impacts to Scenic Resources: A comprehensive planning effort could help to identify specific natural, cultural, rural landscape and agricultural resources that contribute to the scenic values in the area. Desired landscape characteristics would be identified in the CP and receive management attention. Because many of the scenic resources in the Loess Hills are strongly based in ecological and cultural themes, the impacts to scenic resources would be the same as impacts to geology and vegetation under this alternative.

Conclusion: Upon selection of this alternative, the immediate impacts would be negligible. Once a CP was adopted, major, long-term, positive impacts would result. However, in the absence of an ecosystem management approach, including regulation of land use, negative impacts would be moderate (detectable and could have appreciable effect on the resource) to major (moderate to major, long-term, negative).

Socioeconomic Impacts: The area of economic impact would be primarily the communities within or adjacent to the landform region. Economic impacts to other areas would diminish with distance from the landform region. Although there would be negligible costs associated with the formation of a JPB, costs would increase as the planning process was underway. Local communities would be engaged in the planning process, and each of the counties would need to provide a representative to serve on the JPB. Counties would provide funding for planning and implementation. These costs could be balanced by the JPB using its authorities (such as through tax or bond levees) and through participation in partnership opportunities. This could impact tax base and other revenue streams in either a positive or negative direction, depending on the how the JPB uses its authorities. If implemented, property tax credits could affect the local tax base. The extent of the impact would be dependent on the structure and amount of the credits. Stricter controls on uses such as residential development and extraction activities could have negative impact on businesses that are engaged in these activities. Limitations on Land uses within the landform also could suppress future growth in tax base that might otherwise be realized as land was converted from agriculture to more intensive uses. Additionally, with a common plan for the entire landscape, economies of scale could be realized (exact costs would vary between counties, and would depend on the level/extent of the planning effort). Also, better protection of the Hills could encourage more people to visit thereby increasing tourism expenditures. Changes in local ordinances could affect the types of land use allowed in the Loess Hills.

Conclusion: Upon selection of this alternative, the immediate impacts would be negligible. As the planning process was underway, impacts would be negligible, long-term and positive.

This alternative does not include federal acquisition of land. If the National Park Service were asked to provide technical assistance during the planning stages of the Comprehensive Plan, the federal outlay would range between $15,000 and $50,000, assuming a 2-year planning timeframe (Hanson, personal communication 2001). This estimate reflects costs associated with staff time and travel. These costs would vary, depending on the level of assistance requested and the availability of National Park Service funding.

Impacts Associated with Alternative 3 (Environmentally Preferred Alternative)

Under this alternative, the entire Loess Hills landform region would be formally designated as a National Reserve, and would operate as an affiliated area of the National Park System. Affiliated areas are neither federally owned nor directly managed by the National Park Service (NPS). Federal activities within and adjacent to the Reserve would be coordinated with the management entity to ensure significant resource values are protected. The Loess Hills would be operated by a special management entity established at the local, regional, or state level. The management entity would be responsible for the preparation of a comprehensive land management plan (CP) that meets NPS standards and furthers the purposes of the Loess Hills National Reserve. The CP would identify how natural and cultural resources, visitors, growth, and commercial/residential development are to be managed. Local and regional activities would be coordinated and land use efforts would reflect concepts in sustainability. The CP would be updated on a periodic basis, and its implementation would be assured, unlike in Alternative 2, where the development and implementation of a CP is voluntary.

***Impacts to Geologic Resources*:** There would be no immediate impacts to the geologic resources associated with selection of this alternative. Over the long term, because this alternative provides for a comprehensive, integrated approach to managing resources, actions would be taken to reduce erosion and the negative impacts of mining and excavation activities. A coordinated management approach would be applied to state and private lands where landowners expressed an interest throughout the region. The CP would continually be updated and implemented.

Inventories, resource threats, and opportunities for successful management would be identified and prioritized. Protection of the natural vegetative cover and the lessening of over grazing and excavation (mining) activities would slow erosion. Less material would be transported to streams, and the water quality (with respect to sediment loading) within the watershed would gradually improve. Although natural erosion and bluff slumping would continue to occur, over time, the total amount of erosion would be reduced, assuming local ordinances were developed to address this issue.

The designation of the landform region as a National Reserve could possibly increase scientific recognition and interest in the area, and provide funding opportunities for scientific investigations through a variety of sources. This would aid in the understanding and protection of geologic processes.

Conclusion: Upon selection of this alternative, the immediate impacts would be negligible. Upon implementation of the CP, impacts would be long term, and would have a substantial, highly noticeable beneficial influence on the resource (major, long-term, and positive).

***Impacts to Vegetation*:** The short-term impacts to vegetation would be the same as in Alternative 1. In the long-term, upon completion of a Comprehensive Plan, an ecosystem approach to managing the landscape could provide major beneficial impacts. The CP would continually be updated and implemented. Inventories, threats, and opportunities for successful management would be continually identified and prioritized. Woodland habitats, particularly those that support sensitive species, could receive additional attention. The restoration of natural processes such as fire where appropriate would benefit prairie components. Exotic species and tree invasion would be reduced over time, perpetuating native prairie habitats and improving woodland health. The designation of the landform region as a National Reserve would increase scientific recognition and interest in the area. This could possibly provide increased opportunities for scientific investigations through a variety of sources, which would aid in the understanding and protection of natural processes. The Reserve could serve as reference area for the study of ecological succession, for measuring long-term ecological change and as a control area for comparing research results, which would provide additional protection to the natural resources within.

Conclusion: Upon selection of this alternative, the immediate impacts would be negligible. Major, long-term, positive effects to vegetation would result.

Impacts to Scenic Resources: The short-term impacts would be the same as in Alternative 1. A comprehensive planning effort could help to identify specific natural and cultural resources that contribute to the scenic values in the area. Desired landscape characteristics would be identified in the CP and receive consistent management attention. The Reserve would be publicized in National Park Service tourism literature. This greater recognition and protection would likely result in increased visitation to the Hills. Increased visitation may require localized improvements to public roads (widening or resurfacing) which could alter the rural character of some roads if not carefully evaluated.

Conclusion: Upon selection of this alternative, the immediate impacts would be negligible. Once a CP was adopted, major, long-term, positive impacts would result.

***Socioeconomic Impacts*:** The area of the impact would be primarily the communities within or adjacent to the landform region. Economic impacts to other areas would diminish with distance from the landform region. The impacts described under Alternative 1 would also be expected under this alternative. In addition, the designation of the landform region as a National Reserve would bring increased recognition and identity to the Hills. The Reserve could be publicized in National Park Service tourism literature. This greater recognition would likely result in increased visitation to the Hills and, thus, increased visitor expenditures. Increased visitation may, however, require localized improvements to the area infrastructure (for example, a jump in traffic to a nature center may require that a roadway be widened or resurfaced). This could create additional expenses for local governments that may or may not be offset by increased tourism expenditures. However, opportunities to partner

with federal, state, and local agencies would increase. Limitations on land uses within the landform also could suppress future growth in tax base that might otherwise be realized as land was converted from agriculture to more intensive uses.

Conclusion: Upon selection of this alternative, the immediate impacts would be negligible. Once the CP was adopted, associated with increased visitation and partnership opportunities, would lead to positive impacts that are localized and perceptible (Minor, long-term, positive). This alternative does not include federal acquisition of land. If the National Park Service were asked to provide technical assistance during the planning stages of the Comprehensive Plan, the federal outlay would be greater than Alternatives 1 and 2 because of the increased NPS involvement. Expenditures may range between $15,000 and $60,000, assuming a 2-year planning timeframe (Hanson, personal communication 2001), and would continue into the implementation phases. Planning costs represent staff time and travel expenditures. Implementation costs would reflect staff time for technical assistance and coordination, and potential financial assistance (grants). These costs would vary, depending on the level of assistance requested and the availability of National Park Service funding.

Impacts Associated with Alternative 4

Under this alternative, 12 Special Landscape Areas (SLAs) (approximately100,000 acres or about 15 percent of the landform) would be designated as a National Reserve, provided the national significance of each SLA was determined. These 12 landscapes are clusters of exemplary geological/topographical features and prairie (Appendix D). Local government units, as in Alternative 1, would continue to manage the remainder of the landform in a manner consistent with local ordinances and comprehensive plans, if developed. Areas within the Reserve, it is assumed, would receive added protection, particularly because other federal agencies would coordinate their activities to ensure protection of resources within the Reserve, and opportunities for National Park Service technical assistance would increase. Additionally, name recognition and scientific value would be provided to those areas designated in the Reserve, which could lead to additional research and management protection (technical assistance requests and research activities would be dependent upon landowner interest, requests and funding availability).

Impacts to Geologic Resources: This alternative would focus management activities in the Special Landscape Areas, which could provide some localized long-term benefits. The deepest, most accessible, most economically exploitable loess deposits are near Sioux City and Council Bluffs and are within or adjacent to important SLAs (Plymouth South, Council Bluffs North, and Folsom Point) (Appendix D). Thus, designation as a National Reserve could provide protection from further exploitation. The greatest protection would likely be achieved on public lands within the Reserve (which comprise 17 percent of the Special Landscape Areas). Because protection efforts in this alternative would be somewhat fragmented, and would not provide for a holistic, integrated approach to managing the landscape, the long-term impacts would be somewhat less than those of Alternative 3, yet greater than the impacts to geologic resources identified in Alternative 1.

Conclusion: If this alternative were adopted, there would be a positive balance resulting in minor impacts to geologic resources. Upon implementation of a CP for the 12 SLAs, and for each county outside of the SLAs, there would be moderate, long-term beneficial impacts.

Impacts to Vegetation: The short-term impacts to vegetative resources would be negligible. As in above, once the Comprehensive Plan was implemented, an ecosystem approach to managing the prairies could provide beneficial impacts within and outside the Reserve. Management of woodland habitats, particularly those that support state-listed species could receive attention. Native prairie preservation would be enhanced by restoration of natural processes such as fire, which combats tree invasion. Exotic species and tree invasion would be reduced over time, restoring a variety of vegetative communities. Because protection efforts in this alternative would be somewhat fragmented, and would not provide for a holistic, integrated approach to managing the entire landform region, the long-term benefits would be somewhat less than those of Alternative 3, and greater than those identified in Alternative 1.

Conclusion: If this alternative were adopted, there would be no measurable negative impacts to plant communities. Upon implementation of a CP for the 12 SLAs, and for each county outside of the SLAs, there would be moderate, long-term beneficial impacts.

Impacts to Scenic Resources: Because protection efforts in this alternative would be somewhat fragmented, and would not provide for a holistic, integrated approach to managing the landscape, the long-term benefits would be somewhat less than those of Alternative 3, and greater than those identified in Alternative 1.

Conclusion: Impacts within the Reserve would be the same for those identified in Alternative 3, and outside of the Reserve, would be the same as Alternative 1. The overall impact would be moderate, long-term beneficial impacts.

Socioeconomic Impacts: The area of the impact would be primarily the communities within or adjacent to the landform region. Economic impacts to other areas would diminish with distance from the landform region. The long-term economic impacts to local communities would be similar to those identified in Alternative 3. Federal involvement in the Reserve would also be similar, despite the reduced area involved. The challenges to developing a Comprehensive Plan across seven counties would remain the same as in Alternative 3.

This alternative does not include federal acquisition of land. If the National Park Service were asked to provide technical assistance during the planning stages of the Comprehensive Plan, the federal outlay would be greater than Alternatives 1 and 2 because of the increased NPS involvement. Expenditures may range between $15,000 and $60,000, assuming a 2-year planning timeframe (Hanson, personal communication 2001), and would continue into the implementation phases. Planning costs represent staff time and travel expenditures. Implementation costs would reflect staff time for technical assistance and coordination, and potential financial assistance (grants). These costs would vary, depending on the level of assistance requested and the availability of National Park Service funding.

Impacts Associated With Alternative 5 (Preferred Alternative)

Under this alternative, which is the preferred alternative, the Loess Hills would be managed by a JPB, with the option to designate and manage the area as a National Reserve, provided the requirements as described in the Special Resource Study are fulfilled. If the JPB recommended and the requirements were met, the entire Loess Hills landform region would be formally designated as a National Reserve. The Reserve would operate as an affiliated area of the National Park System. Affiliated areas are neither federally owned nor directly managed by the National Park Service (NPS). As a Reserve, Federal activities within and adjacent to the Reserve would be coordinated with the management entity to ensure significant resource values are protected. If this alternative were adopted, it is assumed that a JPB would be formed. Therefore, the initial impacts would be similar to those described for Alternative 1 and 2, depending on how many counties adopted Comprehensive Plans.

However, if a National Reserve were approved by the JPB, then the impacts would be the same as identified in Alternative 3. To achieve National Reserve status, additional steps would be required; hence any positive impacts would likely be realized over a longer time period. If state, local and private entities did not address threats prior to the establishment of a Reserve, there is a possibility that negative impacts could occur, which would require additional effort to mitigate.

Impacts to Geologic Resources: The Joint Powers Board (JPB) would serve to provide a comprehensive, integrated strategy to protect the area's geology and lessen the negative impacts to geologic resources that are currently occurring. Technical experts from various state, federal, and non-governmental organizations would have an opportunity to provide recommendations. Assuming technical advisors from various state, federal, and local groups participated in the planning process, the impacts from this alternative would be long-term, moderate, positive impacts.

In addition, the designation of the landform region as a National Reserve would bring increased recognition and identity to the Hills. The Reserve could be publicized in National Park Service literature. Opportunities for scientific investigations would increase as a result of increased awareness and available cost-sharing programs. National designation would lead to additional protection. Federal activities within and adjacent to the Reserve would be coordinated with the management entity to ensure significant resource values are protected.

Conclusion: If the JPB and the Governor recommend designation of a National Reserve, and if the Secretary of the Interior approves that designation, the impacts, as in Alternative 3, would be long-term, and would have a substantial, highly noticeable influence on the resource (major, long-term, positive impact). If a National Reserve were not designated, impacts would be similar to alternatives 1 and 2.

Impacts to Vegetation: There would be negligible immediate impacts to the vegetation upon adoption of this alternative. In the long-term, once the JPB and its advisors completed a Comprehensive Plan, an ecosystem approach to managing the vegetation could provide beneficial impacts. Woodland habitats, particularly those that support state-listed species

could receive attention through landowner education and assistance programs. Native prairie preservation would be enhanced by restoration of natural processes such as fire, which combats tree invasion. Exotic species and tree invasion would be reduced over time, perpetuating native plant communities.

If a National Reserve were approved, the impacts would be the same as identified in Alternative 3. This alternative would require additional steps to achieve National Reserve status; hence any positive impacts would likely be realized over a longer period of time. However, an ecosystem approach to managing woodlands, native prairies, and other important landscapes could provide major beneficial impacts. Woodland habitats, particularly those that support sensitive species, could receive attention. The restoration of natural processes, such as fire, where appropriate, could be achieved, exotic species and tree invasion would be reduced over time, perpetuating native prairie habitats.

The designation of the landform region as a National Reserve could bring increased scientific recognition to the Hills and opportunities for funding scientific investigations through a variety of sources. This could aid in the understanding and protection of natural processes. The Reserve would serve as reference area for the study of ecological succession, for measuring long-term ecological change and as a control area for comparing research results, which would provide additional protection to the natural resources within. Finally, federal activities within and adjacent to the Reserve would be coordinated with the management entity to ensure significant resource values are protected.

Conclusion: If the JPB and the Governor recommend designation of a National Reserve, and if the Secretary of the Interior approves that designation, long-term, major beneficial impacts would result (major, long-term, positive). If a National Reserve were not designated, impacts would be similar to alternatives 1 and 2.

Impacts to Scenic Resources: Upon adoption of this alternative the immediate impacts to scenic resources would be negligible. Once the Joint Powers Board (JPB) was formed, it would serve to provide a comprehensive, integrated strategy to protect the areas scenic resources. Desired landscape characteristics would be identified in the CP and receive consistent management attention. If established, the National Reserve could be publicized in tourism literature. This greater recognition and protection would likely result in increased visitation to the Hills. Increased visitation may require localized improvements to public roads (widening or resurfacing) that could alter the rural character of some public roads if not carefully evaluated.

Conclusion: If the JPB and the Governor recommend designation of a National Reserve, and if the Secretary of the Interior approves that designation, the impacts, as in Alternative 3, would be long-term, and would have a substantial, highly noticeable influence on the resource (major, long-term, positive impact). If a National Reserve were not designated, impacts would be similar to alternatives 1 and 2.

***Socioeconomic Impacts*:** The area of the impact would be primarily the communities within or adjacent to the landform region. Economic impacts to other areas would diminish with distance from the landform region.

Conclusion: If the JPB and the Governor recommend designation of a National Reserve, and if the Secretary of the Interior approves that designation, impacts would be slightly more than those identified in alternatives 3 and 4. Costs would be expected to be higher because additional mitigation/restoration activities would be required in areas where degradation occurred in the interim. If a National Reserve were not designated, impacts would be similar to alternatives 1 and 2.

This alternative does not include federal acquisition of land. If the National Park Service were asked to provide technical assistance during the planning stages of the Comprehensive Plan, the federal outlay would be greater than Alternatives 1 and 2 because of the increased NPS involvement. Expenditures may range between $15,000 and $60,000, assuming a 2-year planning timeframe (Hanson, personal communication 2001), and would continue into the implementation phases. Planning costs represent staff time and travel expenditures. Implementation costs would reflect staff time for technical assistance and coordination, and potential financial assistance (grants). These costs would vary, depending on the level of assistance requested and the availability of National Park Service funding.

Cumulative Impacts

A cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis. The cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal, or private) is taking the actions (Environmental Protection Agency 1999).

There is a myriad of past, present, and future actions (both public and private) that affect the Hills. Some impact the Hills in a positive manner (such as The Nature Conservancy's efforts to protect land); others impact the Hills in a negative manner (such as urban sprawl). The interaction of all of these influences is dynamic. However, it seems clear that, to-date, the net result of all of the influences has been a net degradation of the outstanding qualities of the landform region. Absent a landform-wide comprehensive plan and/or focused conservation initiatives, the net impact on the Hills is likely to continue to be negative. With implementation of any one of the alternatives outlined in this study, there is good reason to believe that degradation of the resources of the Hills would be neutralized, if not reversed. As the Loess Hills is an occupied landscape, resources always will be susceptible to the actions of humans. Some cumulative impacts would be negative; some positive. Implementation of any alternative in this study should result in net aggregate positive impacts to the Loess Hills.

PRIMARY DIFFERENCES IN IMPACTS BETWEEN ALTERNATIVES

The Preferred Alternative (Alternative 5) and Alternatives 1-4 share many common elements. The alternatives also have differences. All action alternatives are intended to support the preservation and protection of the significant resources in the Loess Hills, provide for public understanding and appreciation of the Loess Hills, and avoid unacceptable impacts to local landowners and communities within the Loess Hills.

Because the alternatives share many common elements, many impacts of the alternatives would be similar. The difference in the impacts created by each alternative is related to the degree of comprehensive planning that takes place; frequently this difference can be expressed only in terms of timing or the level of intensity. That is, an impact on a resource may be similar among alternatives, but would be of slightly more or slightly less magnitude because of the emphasis on an action or the extent or level of comprehensive planning that would occur under a particular alternative and when land-use plans are implemented.

This section briefly highlights some of the notable differences in impacts between alternatives. It is also noted that the implementation of any of the action alternatives, including the preferred alternative, would result in improved protection of the landform and its resources than would result if the area continued to be managed as it is now (that is, under Alternative 1). Any of the action alternatives would also result in improved visitor experiences and increased visitor understanding of the Loess Hills.

Among the alternatives,

- Alternatives 2, 3 and the Preferred Alternative (5) would provide for greater protection of Loess deposits, bluffs, and other landscape features than any other alternative because these alternatives would place a strong emphasis on a regional, holistic approach to landscape management.
- Likewise, Alternatives 2, 3, and the Preferred Alternative (5) would provide for a greater expression of vegetative species diversity than any other alternative because these alternatives would place a strong emphasis on a regional approach to landscape management, particularly the prairie landscape and those processes documented to increase diversity.
- Alternative 1 and to a certain extent Alternative 4 (outside of the SLAs) could result in uncoordinated efforts and gaps that could result in a continuation of mining activities and/or development in sensitive areas in some or all of the affected counties.
- The Preferred Alternative and Alternative 3 would provide for the greatest understanding of natural resources and biological communities because of the emphasis on the Loess Hills landscape, prairies, and associated processes, and the emphasis on the integration of inventories, monitoring, and research activities between private and public entities.

- Alternative 4 places emphasis on selected, high-quality resource areas; hence, a triage approach is provided that directs financial resources to areas in the greatest need of attention.
- Alternative 1, and to some extent Alternative 2, enables land management planning decisions and protection responsibilities to occur at a local level, which could allow for quicker implementation of needed actions because there are fewer steps in the approval process.
- Alternative 1 does not provide for National Park Service involvement or technical assistance.
- Alternative 2 provides for a regional, holistic approach to management with local counties represented, and does not involve the NPS.
- Alternatives 3 and 5, if fully adopted, formally recognize the national significance of the entire 640,000-acre Loess Hills in Iowa.
- Alternatives that emphasize the development of a single integrated Comprehensive Plan for the entire Loess Hills landform region (i.e., Alternatives 2, 3, and 5), particularly those that involve NPS assistance and review (Alternatives 3 and 5), offer greater potential for significant resources to be fully considered during land-use planning and management decisions.
- The adoption of a regional Comprehensive Plan is voluntary in Alternative 2, and is required in Alternative 3 and 5.
- On a comparative basis, the financial costs to the federal government (for technical assistance and assuming funding/staff was available) would be the greatest for Alternatives 3 and 5, and the least for Alternative 1 (assuming federal funding/staff was available).
- None of the alternatives would result in federal land acquisition.
- Both Alternative 3 and Alternative 5 (if all phases are completed) ensure implementation of regional comprehensive plans, and therefore, offer the most comprehensive protection of resources throughout the Hills. While Alternative 5, originating at the local level, has greater opportunities for building consensus, Alternative 3 could likely be implemented sooner than 5. However, the actions that would protect the resources could still take significant time to be fall into place. Thus, Alternative 3 is the environmentally preferred alternative because it creates a slightly greater possibility for faster and more extensive federal involvement in the Hills, in addition to the available state and local resources.

Of the Alternatives, both Alternative 3 and 5 provide for national recognition of the significance of the Loess Hills, and offer the greatest opportunity for the long-term preservation of the Loess Hills. The Preferred Alternative, Alternative 5 was selected because it provides increased opportunities for consensus building, which in the long-term could prove beneficial to both the resource and communities of the Loess Hills.